

CRAMER DIVISION
GIANNINI
CONTROLS
CORPORATION

Cramer

Time Delay Relays and
Interval Timers

Opening or closing a circuit, or circuits, after a timed interval, or introducing a time lag into an operation, are vital functions of control in every type of equipment or process. The range of devices available to perform these functions varies enormously. The standard Cramer units described in this catalog bracket the operation and cost spectrums. They range from low-cost, fixed-setting units through high reliability, long life, electronic devices. Each has a number of economical options, with additional modifications available. Whatever your timing requirement, Cramer has a unit to meet it. Describe your problem and we will solve it.

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General Information

Interval Timers and Time Delay Relays

The main problem in solving any timing requirement is selecting the proper timer from the wide variety available. The problem is considerably lessened when a basic understanding of the significant features and functions of the various types of timers is achieved. We will attempt to define the types of timers and then supply a simple checklist, so that you can arrive at what will best suit your application.

DEFINITION

While interval timers and time delay relays are often considered to be one and the same, there is a generally understood difference: an interval timer actuates or switches a load at the start of its cycle and switches it off at the end of a timed interval; a time delay relay usually does not actuate or deactuate until after the application of a start, or control, signal—generally after its time delay has ended. Another fundamental difference is that an interval timer will generally suspend operation upon power interruption and resume timing when power is restored, while a time delay relay in most forms will re-set to the starting position when input power fails. These definitions are not absolute, but do indicate generally standard operation.

SELECTION

Your process of proper timer selection can be helped by first defining a few specific requirements:

1. Time interval or delay range
2. Input power
3. Number of contacts, and rating
4. Life (time, or number of operations)
5. Contact sequence (if multiple circuit)
6. Accuracy (overall or repeat)
7. Fixed or adjustable setting
8. Progress and setting indication requirement
9. Momentary or sustained start signal
10. Mounting—panel or chassis

Time range—The majority of timing units are supplied with an adjustable, calibrated setting scale. However,

certain units may be furnished without a scale, set for a specific time period—generally at lower costs than adjustable models. Therefore, the interval or time delay range would need to be expressed either as a fixed time to be factory set, or as a maximum setting for an adjustable range. The time ranges of most motor driven timers falls between 5 and 6 seconds and 120 hours, with 10 to 15 different individual scale ranges normally available as standard on adjustable models. Since both the minimum possible setting and the accuracy are functions of the maximum time range, you are better off to select a range that does not exceed your expected maximum settings by any large margin. The practical minimum setting is generally about 3% of the overall scale. On a 6 second timer, for instance, this would be 2/10 of a second. Electronic timers are furnished in ranges from 1 second (with a minimum setting of .04 seconds) to about 5 minutes. Electronic timers are more suitable for the shorter timing intervals, due to the inherent reliability of solid state circuitry. But, electronic timers lack progress indication and are slightly less accurate—particularly when a wide temperature range is encountered.

Input power—Most common voltages are listed as available input power under the specifications for any individual type. However, many specials can be supplied. You should keep in mind that any variation in power supplied can affect the timer's operation. And, while DC voltages are obtainable in most cases, the cost is normally higher. In general, DC voltages should be considered very carefully, for DC also affects accuracy and life.

Contacts—Obviously, you must specify the number of load circuits or contacts that are required, as well as any desired specific sequence of operations. It generally is less expensive to operate a multi-pole load relay from a single timer contact if several load contacts are required to operate simultaneously.

Life—The limiting factor in the life of a timer is usually its switch contacts—unless operated at a reduced current. The current rating varies on different timer types, depending upon the switch configuration employed. Best

results will be obtained if it is not run to its maximum level. Full rated current may provide numbers of operations in the range of 25,000 to a quarter-million, while the mechanical life of the timer would fall between half-a-million and 2-million operations. Electronic timers achieve the greatest life, with solid state output and loads of relatively low level DC.

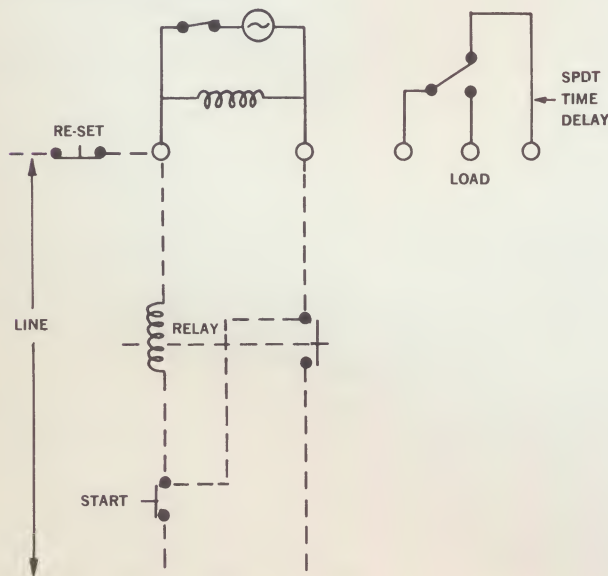
Accuracies—Accuracies are usually expressed as a percentage of the overall or maximum range. In most cases, figures are given for both overall and repeat accuracies. On AC types, accuracies usually fall between $\frac{1}{4}\%$ and $2\frac{1}{2}\%$. DC timing accuracies vary from a fraction of 1%, for units with chronometrically governed drive motors, to 20% on ungoverned types with temperature and voltage fluctuations.

Settings and progress indication—Timer types that are adjustable provide a calibrated dial. A setting knob on the face of the timer is the most common method of timing adjustment, but there are units with a graduated disc, or setting wheel, which is rotated and aligned with an index mark and locked with a screw. Progress indication, however, is generally limited to panel mounting types. Electronic timers do not offer progress indication, but with the shorter times involved it is not as likely to be a consideration.

Mounting—Panel mounted types are installed with the timing scale, pointers and setting knob projecting to the front of the equipment panel, with the timer body, including terminal connections, protruding to the rear. Chassis versions mount and project entirely on one surface of a vertical or horizontal chassis.

Momentary or sustained start—When a sustained control switch or input is intended, you need no special provisions. If a momentary starting signal is to be used, you need a contact available that is actuated by the timer clutch solenoid. This internal clutch contact seals-in the clutching circuit for the remainder of the time delay after the momentary signal is terminated. Not all types of timers can be supplied with a clutch contact. With those that cannot, it is necessary to employ an additional relay to allow momentary pulse starting. The following schematic illustrates this point.

MOMENTARY START USING EXTERNAL RELAY



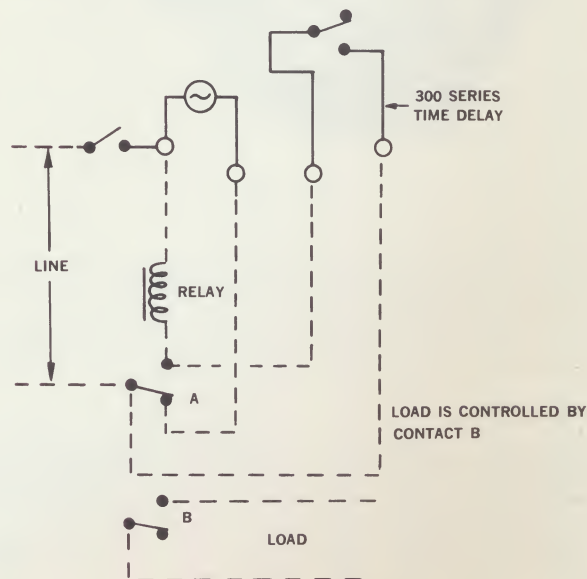
STANDARD AND REVERSE CLUTCH

To define standard and reverse clutch, let's look at an example. Upon application of power to the clutch circuit, a standard clutch will engage the drive motor to the timing mechanism but a reverse clutch will disengage the two. With a standard clutch type, power is applied to both the motor and the clutch to initiate the time cycle. With reverse clutch operation, the timer in its rest or starting state is in a timed-out condition with the load switches transferred to the OFF position and the cycle is started by pulsing the clutch circuit. The pulse disengages the clutch allowing the timer to re-set and switch on the load circuit. When the momentary re-set pulse is terminated, the clutch re-engages and the timer proceeds through its time cycle, transferring the load circuit at the end of the cycle. A standard clutch type will re-set to START condition upon power interruption, either during or after completion of the timing, but a reverse clutch time delay relay will suspend timing upon power failure and resume timing when it is restored. In some cases, reverse clutch timers have been referred to as "Off Delays."

300 SERIES TIMING

With timers in the 300 series (310, 330) incorporating integral clutch timing motors, the specifications indicate that optimum performance will be obtained if the timer is allowed to re-set immediately upon completion of the time delay. This lessens the stress placed on the clutching mechanism within the timing motor. If it is not practical from a control circuitry standpoint to remove power from the timer immediately at the conclusion of timing, then the addition of a relay, as shown in the schematic below, will obtain the same result.

HOW TO DE-ENERGIZE 300 SERIES TIME DELAY AT COMPLETION OF TIMING



SPECIAL TIMING APPLICATIONS

In addition to the basic standard models described in the following pages, a great variety of special purpose devices and modifications of standard types are available. Describe your application to our local sales engineer, or contact the factory direct, for a prompt and detailed recommendation tailored to meet your exact timing requirement.

CRAMER 241

Automatic Reset Interval Timer

Push-button Start, Automatic Shut-off,
Instant Re-set

6 Second to 120 Hour Time Ranges

0.25% Repeat Accuracy

Controls a wide variety of electrically operated equipment such as copying machines, mixers, ovens, tumbling and plating machines, and insulation testing machines.



Cramer 241 Timer provides pushbutton starting, automatic shut-off and instantaneous re-set. The unit is available in 15 full-scale ranges from 6 seconds to 120 hours (see specifications), and utilizes a permanent magnet synchronous motor for extremely high accuracy at a competitive cost.

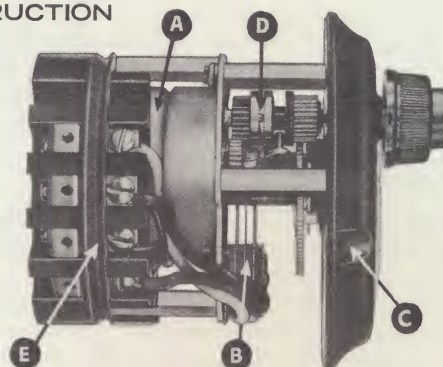
OPERATION

Using the knob, set pointers to the desired time interval on the dial. Press the start button. Depressing the start button closes the internal load contact, actuating the load circuit and the timer motor. As timing progresses, the red setting pointer remains on the initial time setting while the black progress pointer moves down-scale toward zero, indicating the time remaining to complete the chosen cycle. When the black pointer reaches zero, the load switch opens and the timer automatically re-sets to await another start signal. If power fails, the unit suspends operation.

IMMEDIATE DELIVERY

The Cramer 241 Timer, in the entire list of ranges given in the specifications for 115 volts, 50 or 60 cps operation, is available for immediate shipment on small quantity orders. Many popular ranges for 220 volt, 60 cps operation are also stocked.

CONSTRUCTION



CONTACT CLOSE-UP

- A. Cramer permanent-magnet motor drive provides quick start, truly synchronous operation, and no coasting on removal of power.
- B. Heavy duty contacts handle high inrush currents.
- C. Mounting simplicity. Mounts in circular panel cut-out with 3 holes on 1.687" radius. Interchangeable with Cramer Timers 230 and 320, which the 241 replaces.
- D. Positive, no-slip clutch features 60-tooth ratchet design. Long mechanical life and high accuracy are provided by this thoroughly tested ratchet device.
- E. O-ring retainer snaps into groove—permits easy removal of housing sleeve for inspection.

SPECIFICATIONS

Time Ranges:

Time Ranges	Dial Divisions	Time Ranges	Dial Divisions
6 sec.	0.1 sec.	60 min.	1.0 min.
15 sec.	0.25 sec.	5 hours	5.0 min.
30 sec.	0.5 sec.	12 hours	15.0 min.
60 sec.	1.0 sec.	24 hours	30.0 min.
120 sec.	2.0 sec.	48 hours	60.0 min.
5 min.	5.0 sec.	96 hours	2 hours
15 min.	15.0 sec.	120 hours	2 hours
30 min.	30.0 sec.		

Minimum Setting: Two dial divisions

Repeat Accuracy: Within $\pm 1/4$ of 1% of full scale on timers with 30 second or longer ranges, $\pm 1/2$ of 1% on timers with shorter than 30 second ranges.

Dial: Fully enclosed, black on white, high visibility dial with 300° scale protected by plastic dome of excellent optical quality and shock resistance.

Re-set: Less than $1/2$ second re-set time. 36 coil re-set spring provides uniform re-set action regardless of timer setting.

Controls: Friction setting mechanism with large knurled knob, with integral start button, permits rapid setting changes while unit is running.

Power: Available for 115 or 220 volts at 25, 50 and 60 cycles. Power input: 4.75 volt-amperes at rated voltage, 60 cycle.

Load Contacts: Ratings with non-inductive load: 15 amps at 125 volts; 10 amps at 250 volts. SPDT snap-action load contacts are silver-cadmium oxide.

Terminals: Screw-lug terminal block permits connections from either side or rear.

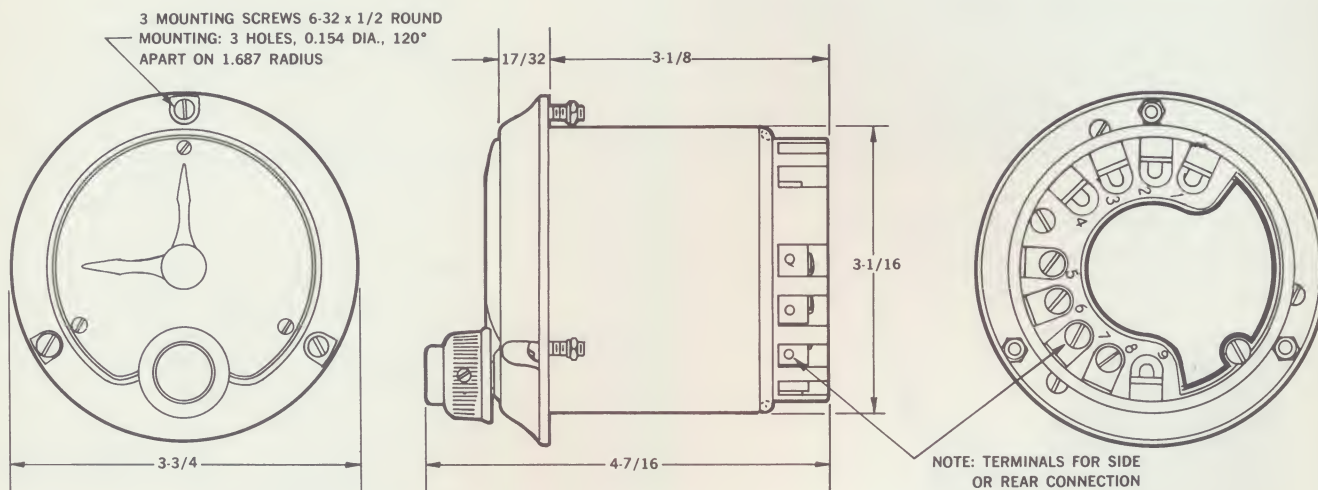
Motor: Cramer permanent-magnet motor, quick start, synchronous operation, no coasting on removal of power.

Clutch: Positive, no-slip, 60 tooth ratchet, long mechanical life and high accuracy.

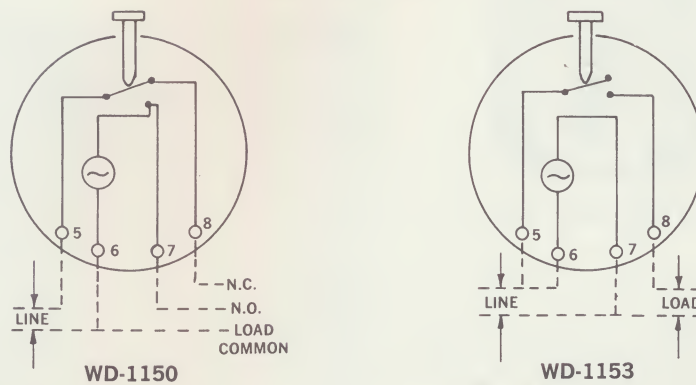
Mounting: Panel mount (see CONSTRUCTION section).

Housing: Portable housing, conduit box, formed steel enclosure.

DIMENSIONS



WIRING



NOTE: Wiring Diagram WD-1150 is standard for the Type 241. With this arrangement, the drive motor is energized at the start of each cycle and de-energized as the unit times out and re-sets.

Wiring diagram WD-1153 is a readily available special wiring arrangement. The motor is directly connected to the line and operates continuously. Pushbutton actuation engages the timing mechanism. Unit re-sets at end of interval, but motor continues to operate.

ORDERING INFORMATION

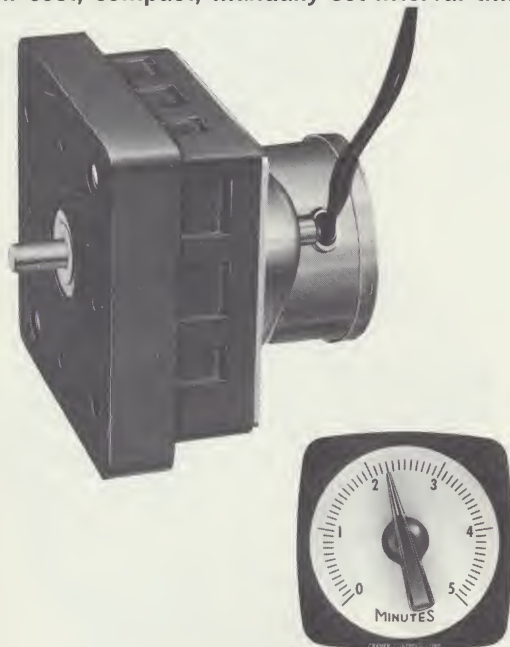
Timer: 241
Time Range
Voltage & Frequency
Wiring Diagram: WD-1150 or WD-1153

CRAMER 271

Low Cost Interval Timer

Designed Primarily for Built-In Applications
60 Second to 72 Hour Time Ranges
Accuracy: Within 0.5% of Full Scale

Developed to control ON and OFF times for a variety of applications, the Cramer 271 is a low cost, compact, manually set interval timer.



Standard dial, knob and pointer can be supplied

Cramer 271 Interval Timer is designed primarily for built-in applications and is available with or without a standard dial and pointer-knob. It controls ON and OFF intervals for a number of applications in ranges from 60 seconds to 72 hours.

OPERATION

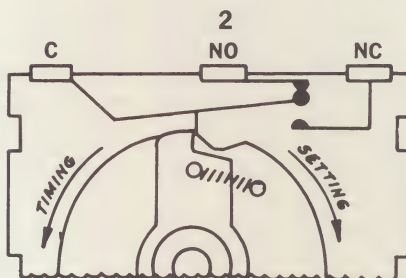
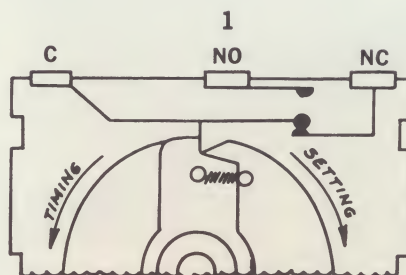
Turning the pointer clockwise to the chosen setting transfers the load switch, energizes the high torque motor and initiates timing. The setting pointer indicates timing progress as it moves back towards zero. Setting can be changed while timing is in progress. As the timed interval ends, the load switch transfers to its original position and the motor is automatically de-energized.

In two-pole units, the second cam is factory set to operate immediately prior to the first. The normal operating point is zero, but the second cam can be set to operate at any point in the 270° scale if so specified.

APPLICATIONS

Cramer 271 controls the ON and OFF time intervals for a variety of operations; including the regulation of driers, ovens, photographic equipment, battery chargers, production machinery and others.

CAM WITH REVERSING PAWL



Spring loaded reversing pawl provides "drop off" for fast contact transfer at end of cycle and allows gradual rise for setting operation.

SPECIFICATIONS

Time Ranges:

Time Range	Dial Divisions*	Time Range	Dial Divisions*
60 sec.	2.0 sec.	60 min.	2.0 min.
5 min.	10.0 sec.	5 hr.	10.0 min.
15 min.	30.0 sec.	12 hr.	24.0 min.
30 min.	1.0 min.	24 hr.	48.0 min.
		72 hr.	2.0 hr.

*Standard dial available.

Lower contact ratings will permit time ranges shorter than 60 seconds. For additional special time ranges, consult factory or your nearest Cramer representative.

Minimum Setting: 9 degrees.

Overall Accuracy: Within 0.5% of full scale, exclusive of human setting error.

Total Travel: 270 degrees.

Ratings: Available in 115 volt and 220 volt, 50 and 60 cycles. For special AC requirements and DC ratings, consult factory.

Input: 2.75 watts at rated voltage.

Load Circuits: One or two.

Switches: SPDT open-blade switches.

Switch Contacts: Silver-cadmium-alloy, rated at 30 amperes, 115 volts AC resistive load, or 1/3 HP motor load at 115 volts AC.

Terminals: Quick disconnect, spade type. Terminals are numbered on underside of Bakelite body for wiring convenience. Male portion is integral portion of timer, Cramer can supply female portion on request.

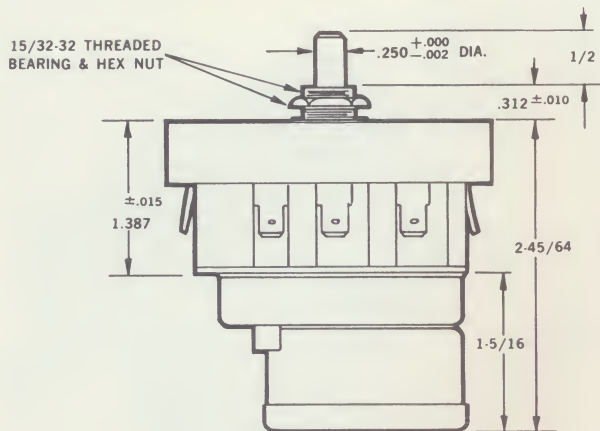
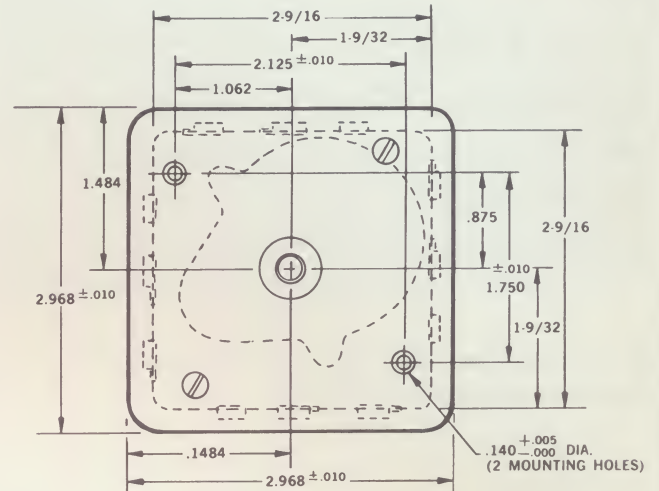
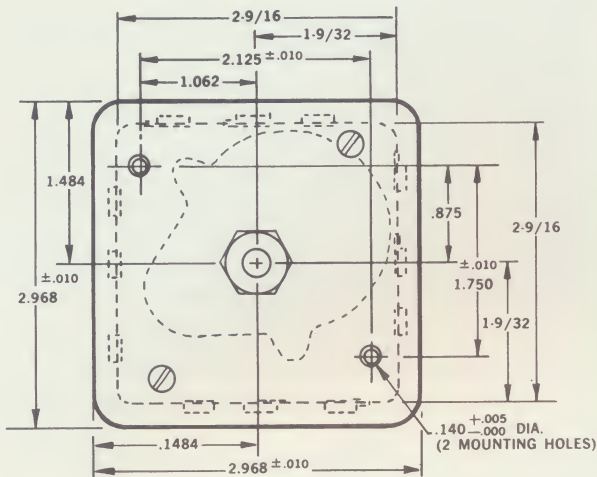
Motor: High torque (30 inch-ounces at 1 RPM).

Mainshaft: 0.250" dia. steel shaft extends 0.500" above standard bearing and 0.250" above threaded center-mount bearing (see DIMENSIONS).

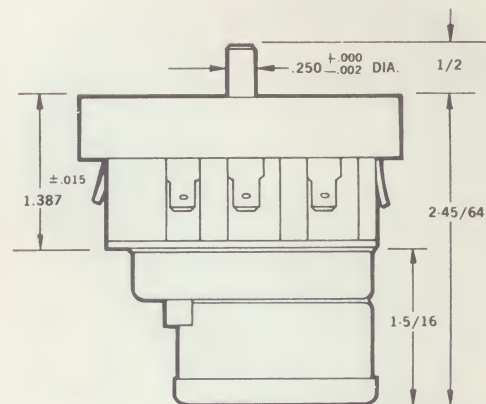
Cams: Precision cut BAKELITE cams incorporating a spring-loaded reversing pawl for accuracy and long contact life.

Mounting: Can be face mounted or center mounted.

DIMENSIONS

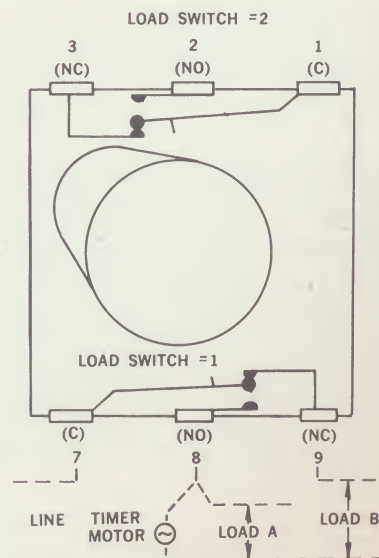


CENTER MOUNTING



FACE MOUNTING

WIRING



NOTE: Bottom view of timer Load A is energized when timer runs.

ORDERING INFORMATION

Timer 271
 Time Range
 Voltage and Frequency
 Number of poles: 1 or 2. If two specify
 operating point for pole #2.
 Mounting style: Face or Center Hole
 Other Features: Dial, Knob, etc.

CRAMER 310

Adjustable Time Delay Relay

15 Second to 2 Minute Time Ranges

2% Accuracy

UL Approved

Provides an exact and adjustable time lag in the operation of industrial controls.



Cramer 310 Time Delay Relay introduces an exact and adjustable time lag into any process upon the application of power. The amount of the delay is accurate within 2% of full scale time range for the particular timer selected, permitting a high degree of control precision.

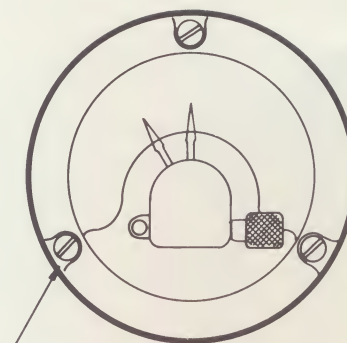
OPERATION

Setting the delay is accomplished by means of a knob on the front of the unit. Rotating the knob simultaneously positions the twin pointers at the desired setting. Applying power through an external sustained contact starts the synchronous motor in the timer. One of the pointers remains stationary, serving as a setting indicator. The second pointer moves across the face of the dial toward zero, showing the progress and unexpired portion of the time cycle. As the second pointer reaches zero, the delay is complete and the load switch is actuated. When the external control contact is broken the load switch reverses to its original position and the timer automatically re-sets to the established delay setting, ready for a new cycle. Optimum performance is obtained when the timer is permitted to re-set immediately upon completion of the cycle. Refer to the schematic in the General Information section of this catalog for additional information.

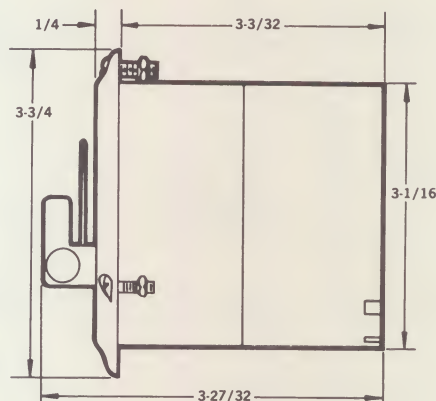
APPLICATIONS

Cramer 310 Time Delay Relay provides a time lag in the operation of process controls, shakers, automatic doors, heat treating equipment and similar applications.

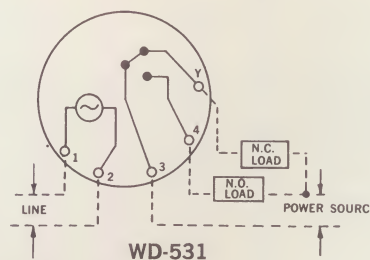
DIMENSIONS



3 MOUNTING SCREWS 6-32 x 1/2 ROUND HEAD
3 MOUNTING HOLES .154 DIA. 120° APART ON 1.687" RADIUS



WIRING



SPECIFICATIONS

Time Ranges:

Time Range	Minimum Setting	Dial Divisions
15 sec.	0.75 sec.	0.25 sec.
30 sec.	1.50 sec.	0.50 sec.
60 sec.	3.00 sec.	1.00 sec.
120 sec.	6.00 sec.	2.00 sec.

Overall Accuracy: Within 2% of full scale (inclusive of setting).

Repeat Accuracy: Within $\pm 1/2$ of 1% of full scale.

Power Input: 5.0 volt-amperes at rated voltage.

Motor Voltages: 115 volts and 240 volts, 50 and 60 cycles.

Switches: Totally enclosed SPDT quick-make, quick-break switches, rated at 10 amperes at 125 volts, 5 amperes at 250 volts, non-inductive.

UL Approved: For industrial control applications.

ORDERING INFORMATION

Timer 310

Time Range

Voltage and Frequency

Wiring Diagram (WD 531 is Standard)

Enclosure, if other than panel mounted (example: Conduit Box, portable housing, etc.)

CRAMER 330

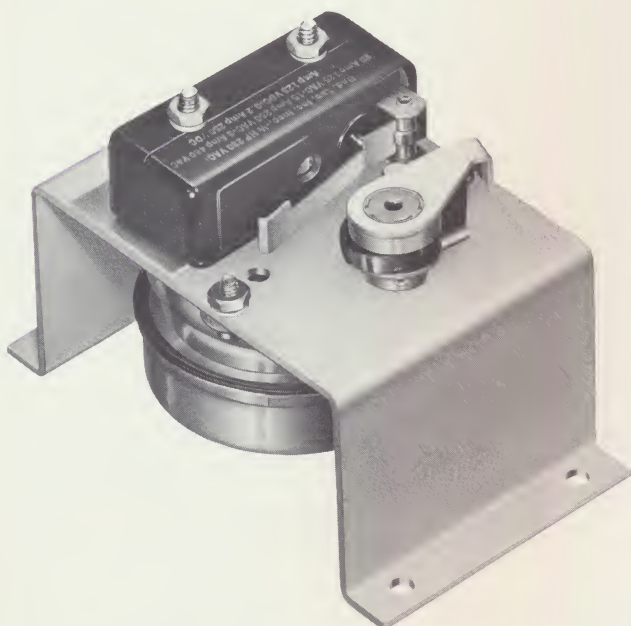
Low Cost Time Delay Relay

One to 80 Second Time Ranges

$\frac{3}{4}$ of 1% Repeat Accuracy

Adjustable

A low cost, adjustable relay designed for applications which do not require frequent timing adjustments.

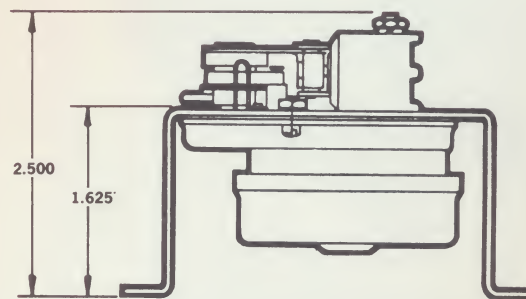
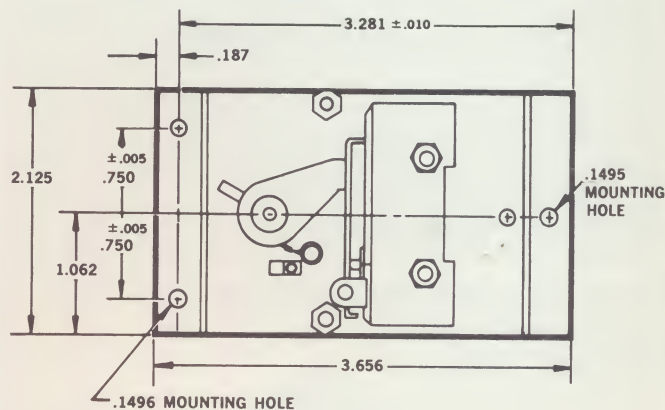


Cramer 330 is simple in design, rugged in construction, with good repeat accuracy and extended trouble-free life. Its movable arm can be positioned for any desired delay within the time range of a given unit.

OPERATION

The required time delay is set by positioning an adjustable arm, secured by set screws to the shaft of the synchronous motor. Applying power through an external, sustained contact starts the motor, driving the arm at constant speed until it actuates the snap-acting load switch, thus closing the load circuit. The timer stays in this position until the control contact is broken, permitting a spring to return the arm to its initial position for the start of another cycle. Optimum performance is obtained when the timer is allowed to re-set immediately upon the completion of the cycle. The movable arm can be positioned for any desired delay within the range of the particular unit selected, and the accuracy of the setting is easily checked with the second hand of a watch.

DIMENSIONS



SPECIFICATIONS

Time Ranges:

Time Range	Minimum Setting	Number of Poles
20 sec.	1 sec.	1
40 sec.	2 sec.	1 or 2
80 sec.	4 sec.	1 or 2

Repeat Accuracy: Within $\frac{3}{4}$ of 1% of total range.

Power Input: 5.0 amperes at rated voltage.

Motor Voltages: 115 and 240 volts, 50 and 60 cycles.

Switches: Totally enclosed quick-make, quick-break SPDT or DPDT, rated at 10 amperes at 125 volts, 5 amperes at 250 volts, non-inductive.

ORDERING INFORMATION

Timer 330

Time Range

Setting, if other than full range

Voltage and Frequency

Number of Poles: 1 or 2

CRAMER 380 SERIES

Industrial Solid State Time Delay Relays

Long Life

1 Second to 5 Minute Ranges

Fixed or Adjustable Delays

Base or Panel Mount

High reliability units operating directly from an AC power line easily adapt to many and varied timing applications.



BASE MOUNT



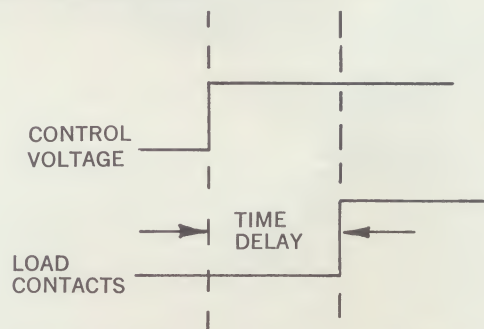
PANEL MOUNT

Cramer 380 Time Delay Relays are industrial units whose solid state design makes possible both long life and shorter time ranges. Featuring two levels of accuracy, four standard time ranges (with many special time ranges economically available), and a choice of base or panel mounting, the units offer the system designer the versatility required to fill most industrial applications. Optional features, such as remote adjustability and solid state output, further extend the usefulness of the 380.

Construction is husky. The compact enclosure, equipped with an octal plug-in base, is dust and moisture resistant. High grade components are mounted on rigid printed circuit boards, with tantalum capacitors and wirewound variable resistors used when necessary for high accuracy. Shock and vibration levels normally encountered in ground based equipment have no detrimental effect.

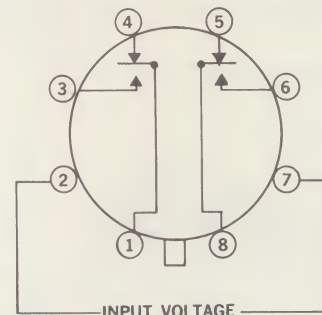
Applications for the 380 include any industrial application where a great many operations are required; such as plastic molding equipment, heat treating equipment. X-ray equipment, etc.

MODE OF OPERATION

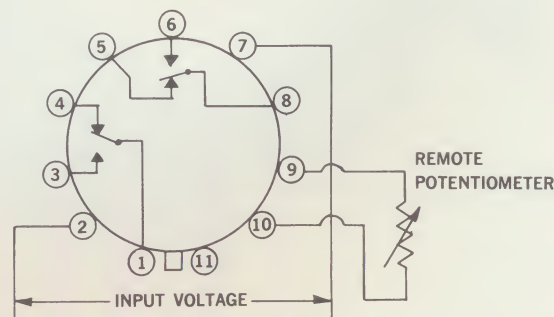


Time delay after application of control voltage. Close control switch to time. Open control switch to re set.

WIRING



STANDARD UNITS
WD 1409



REMOTE ADJUSTMENT UNITS
WD 1498

SPECIFICATIONS

Time Ranges: Standard—15, 30, 60 or 120 seconds; Special—1 second, 3, 4 or 5 minutes.

Accuracy: Standard accuracy (base mount units) at rated voltage: overall— $\pm 10\%$ full scale; repeat— $\pm 5\%$ full scale.

Special accuracy (panel mount units) at rated voltage: overall— $\pm 2.5\%$ full scale; repeat— $\pm 1.5\%$ full scale.

Re-set Time: 30 milliseconds.

Power Source, Standard: 120 volts $\pm 10\%$, 50 or 60 cycles.

Power Source, Special: 24 or 240 volts, 50 or 60 cycles; 24, 125 or 250 volts DC.

Contacts: DPDT, 10 amp resistive.

Life: 10,000,000 mechanical operations (relay).

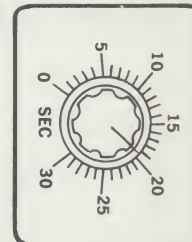
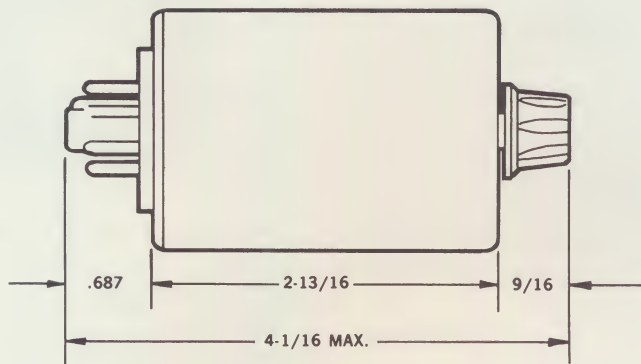
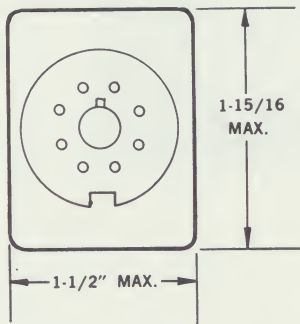
Operating Temperature Range: For full accuracy, $+20^\circ$ to $+100^\circ\text{F}$; maximum safe range, -20° to $+120^\circ\text{F}$.

Warm-up Time: None required.

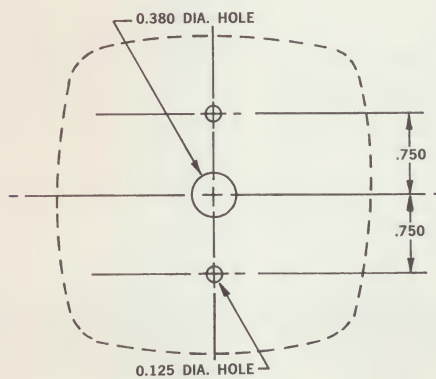
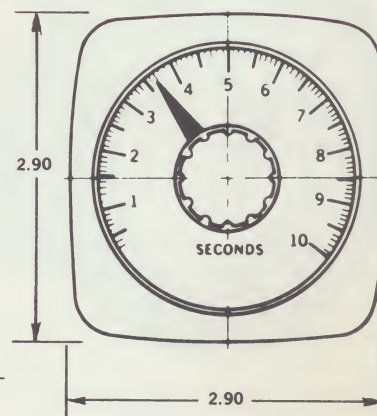
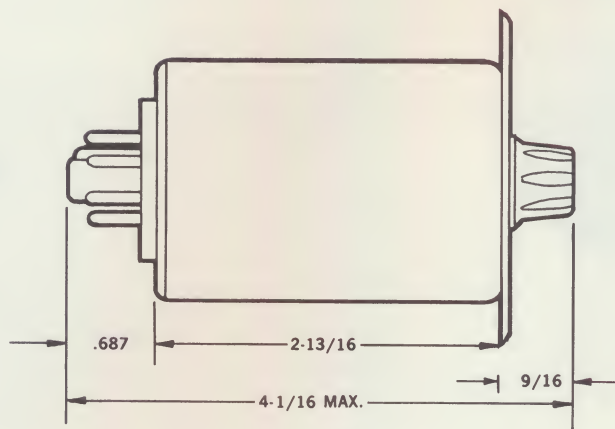
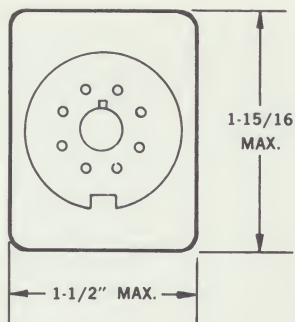
Operating Position: Any.

Options: Solid state (250 M.A., 28 VDC) output; remote control potentiometer, knob and dial; fixed time delay.

DIMENSIONS



STANDARD OCTAL BASE MOUNT



STANDARD PANEL MOUNT

ORDERING INFORMATION

Timer 380
 Time Range: 15, 30, 60 or 120 Seconds, or Special
 Voltage and Frequency: 24, 120 or 240 volts, 50/60 cycles
 AC; 24, 125 or 250 volts DC
 Mounting: Base or Panel
 Adjustability: Standard, Remote or Fixed

CRAMER 412/422/742 SERIES

Versatile Time Delay Relay

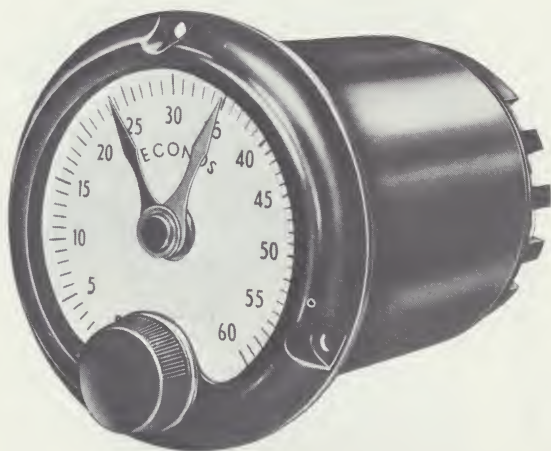
Three Internal Contact Arrangements

Three Control Arrangements

Standard or Reverse Clutch

15 Full Scale Ranges from 6 Sec. to 96 Hrs.

Provides an accurate, adjustable time delay between the operation of a control circuit and the closing of one or two load circuits.



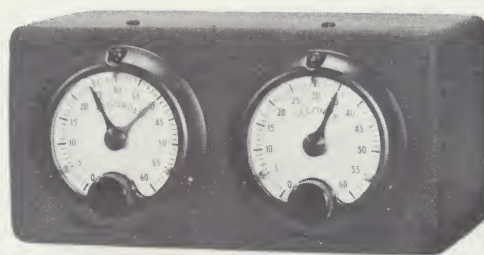
412

Cramer 412 Time Delay Relay offers almost unlimited application versatility. Three internal contact arrangements are available to determine the load switch position in the before-during-after timing conditions. These can be combined with any of three control arrangements; automatic re-set on completion of timing, timed out until re-set button is pushed, timing between electrical pulses. Standard or reverse clutches are available; 15 full scale time ranges from 6 seconds through 96 hours are standard. Each 412 provides instant start, synchronous operation through a Cramer permanent-magnet motor.

The unit is available in three basic types: The 412 described; the 422, which is identical to the 412 except for reverse-clutch action; the 742, which consists of two 412 timers connected in series in a common housing.

APPLICATIONS

The 412 is equally applicable as a time delay relay providing an adjustable time delay between the operation of a control circuit and the subsequent closing of one or two load circuits; or as a remote controlled, automatic re-set interval timer, opening an electrical circuit at a selected interval after simultaneous energization of the control or load circuits. Uses include control of machine tools, batch processes, heat treating and other automatic operations.



742 DUPLEX

Cramer 742 consists of two standard 412 timers connected in series in a common housing. Each timer is independently adjustable, controls its own load, then automatically energizes the other timer. Units continue to operate in turn until power is removed or can be wired to single cycle.

Ranges: Sixty combinations from 6 seconds to 96 hours.
Ratings: 115 or 220 volts, 50 or 60 cycles.

SPECIFICATIONS

Time Ranges:

Time Range	Dial Division	Time Range	Dial Division
6 sec.	0.10 sec.	60 min.	1.0 min.
15 sec.	0.25 sec.	120 min.	2.0 min.
30 sec.	0.5 sec.	5 hr.	5.0 min.
60 sec.	1.0 sec.	12 hr.	15.0 min.
120 sec.	2.0 sec.	24 hr.	30.0 min.
5 min.	5.0 sec.	48 hr.	60.0 min.
15 min.	15.0 sec.	96 hr.	2.0 hr.
30 min.	30.0 sec.		

Minimum Setting: Two dial divisions.

Repeat Accuracy: Within $\frac{1}{4}$ of 1% of full scale on 60 second and longer ranges; within 1% of full scale on faster timers.

Dial: Fully enclosed, high visibility, black-on-white dial with 288° scale. Red setting pointer, black progress pointer.

Re-set Time: Full scale re-set within $\frac{1}{2}$ second.

Controls: Friction setting mechanism with large knurled knob permits fast setting (4:1 ratio) with no pointer play.

Ratings: Available for 115 volts or 220 volts at 50 or 60 cycles. Power consumption (volt-amperes) is: motor—4.75 VA; clutch—10.5 VA.

Power Input: Motor—2.7 watts; clutch—7.0 watts at rated voltage, 60 cycles.

Mechanical: In excess of 1 million operations.

Load Switch: Each timer has an open-blade, SPDT, electrically independent load switch rated 15 amperes at 125 VAC, 10 amperes at 250 VAC. These heavy-duty contacts of silver-cadmium-oxide handle inrush currents up to 40 amperes.

Motor Switch: A separate SPDT motor switch can also be used to control a second load of the same voltage and frequency as the motor itself.

Seal-in Switch: Internal SPST seal-in or hold contacts are provided to allow the 412 Timer to operate from a momentary (1/10 sec.) control pulse.

Terminals: Nine-position block has screw-type terminals, for either side or rear connection.

Dust Resistant: All units are gasket sealed to resist the entry of dust or other foreign matter.

Housings: In addition to standard housing, the 412 can be supplied in conduit box or formed steel housings.

Weight: 2.25 lbs.

OPERATION

Cramer 412 Time Delay Relay is a panel mounted instrument with full scale adjustability. Rotating the friction setting-knob locates both pointers to any point on the dial. Three internal contact arrangements are available, the choice determined by the desired position of the load switch in the before-during-after timing conditions. (See wiring diagrams.) Each of these three mechanisms can be controlled from either a momentary or sustained external contact.

When rated power is supplied to the timer, load-switch transfer occurs on Wiring Diagrams WD1121 & WD1122 (WD1123 does not transfer at start of timing, only at end) as motor and clutch circuits are operated, hence timing begins immediately. Black progress-pointer travels counter-clockwise toward zero scale, at which point the load switch contacts are restored to their original condition (certain wiring diagrams will provide a flash pulse). Re-set may be either automatic on completion of timing, or delayed until the starting impulse for the next operation is received. All 412 relays are supplied with one electrically independent SPDT load switch. A second load, operating after the first (within 1% of full scale) can be controlled from the SPDT motor switch. Type 412 re-sets on power interruption.

Type 422 is similar to Type 412, except for the reverse-clutch action. In this unit, the clutch coil is energized only during re-set. Timing is initiated by closing the clutch circuit momentarily ($\frac{1}{2}$ sec.). This re-sets timer and starts timing. Power interruption simply causes the 422 to suspend operation and continue timing when the circuit is restored. The reverse action of the clutch is also advantageous when the timer is called on to hold in a timed-out condition for an extended period before the next operation.

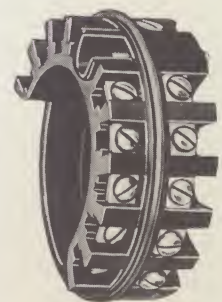
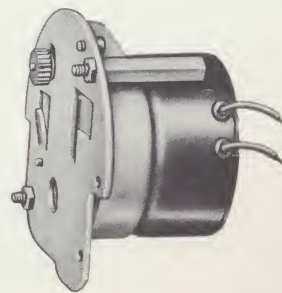
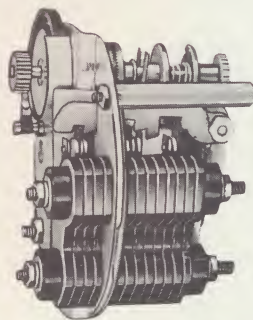
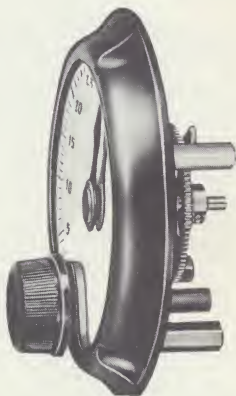
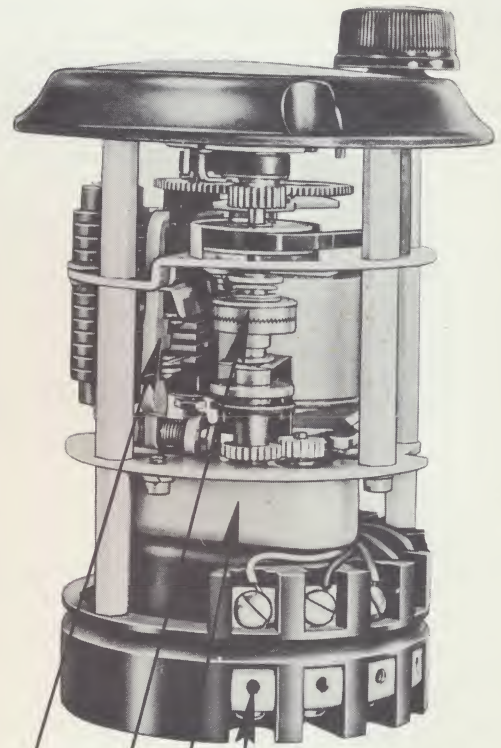
DESIGN FEATURES

Contacts are extra heavy, open-blade, silver-cadmium-oxide capable of handling high inrush currents, provide quick-make, quick-break operation for all time ranges.

Positive Ratchet Clutch has 60 gear teeth, firmly meshed by powerful solenoid.

Powerful Cramer Permanent Magnet Motor provides instant start, truly synchronous operation.

Rugged Barrier-type Terminals allow connections from either side or rear.



CONTROL ARRANGEMENTS

Cramer 412 is available in three basic control arrangements, each with three possible internal contact arrangements; plus the 422 version which is similar except with no re-set on power failure. To determine the version best suited to your particular

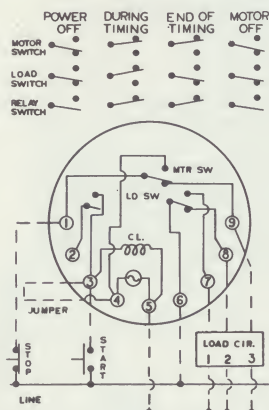
application, pick the correct switching schematic. From this, you can order the correct timer by wiring diagram number (each wiring diagram number has a different factory-set internal contact arrangement), and, by following the diagram chosen, connect the unit to operate under any of the three control arrangements.

412

Pushbutton Start— Automatic Re-set

Control Arrangement "A"—Pushbutton (or electrical pulse) start, automatic re-set on completion of timing. Pushbutton labeled "stop" is optional to permit interruption and re-set during timing. Timer re-sets on power failure.

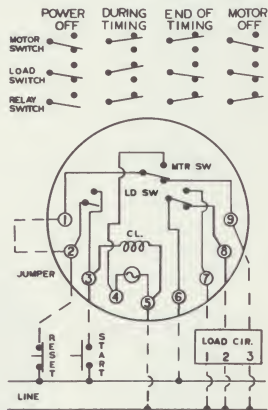
Circuit #2 is made in power off condition. Circuit #1 is made during timing. Circuit #2 is restored on completion of timing.



Pushbutton Start— Timed Out Until Opened

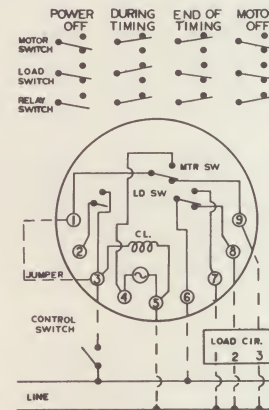
Control Arrangement "B"—Pushbutton start, timer holds in timed out condition until re-set button is pressed. Power failure or operation of re-set button during timing will cause immediate re-set.

W.D.1121



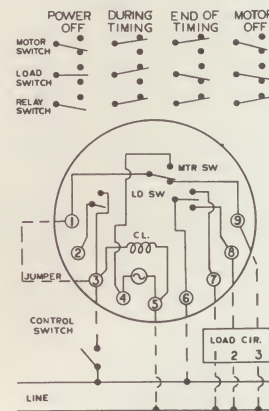
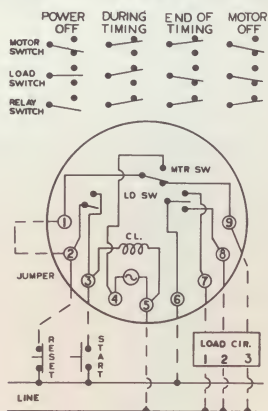
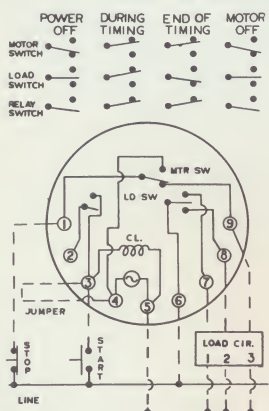
Close Switch to Start— Timed Out Until Opened

Control Arrangement "C"—Timer starts when sustained control switch is closed, and holds in timed out condition until opened. On power failure, timer re-sets and repeats entire cycle when restored.



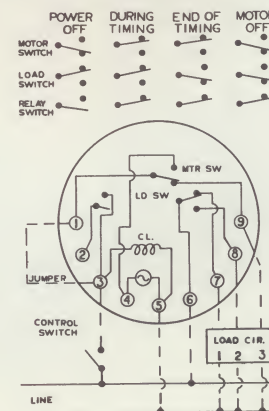
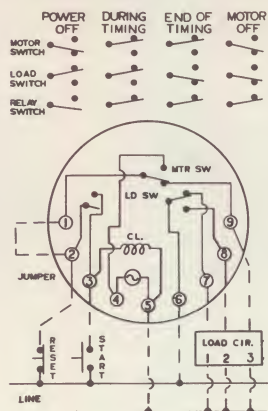
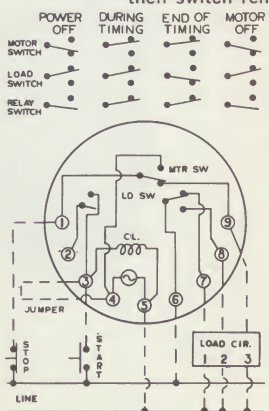
W.D.1122

No load is made in power off condition. Circuit #1 is made during timing. As circuit is broken at end of timing, Circuit #2 is made for a nominal 1% of full scale range (Arrangement "A") or until re-set (Arrangements "B" & "C"); then switch returns to a neutral position.



W.D.1123

Circuit #1 is made in both power off and timing conditions. On completion of timing, Circuit #2 is made for a nominal 1% of full scale range (Arrangement "A") or until re-set (Arrangements "B" & "C"); then switch remakes Circuit #1.

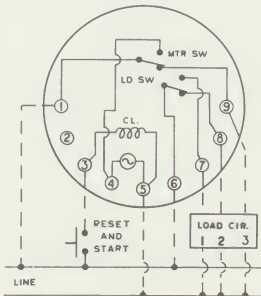
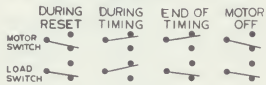


DIMENSIONS

422

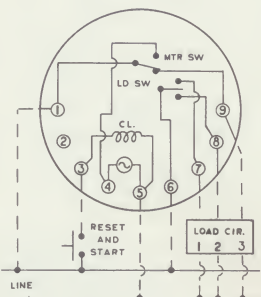
W.D.1124

Same as W.D.1121 except no re-set during power failure.



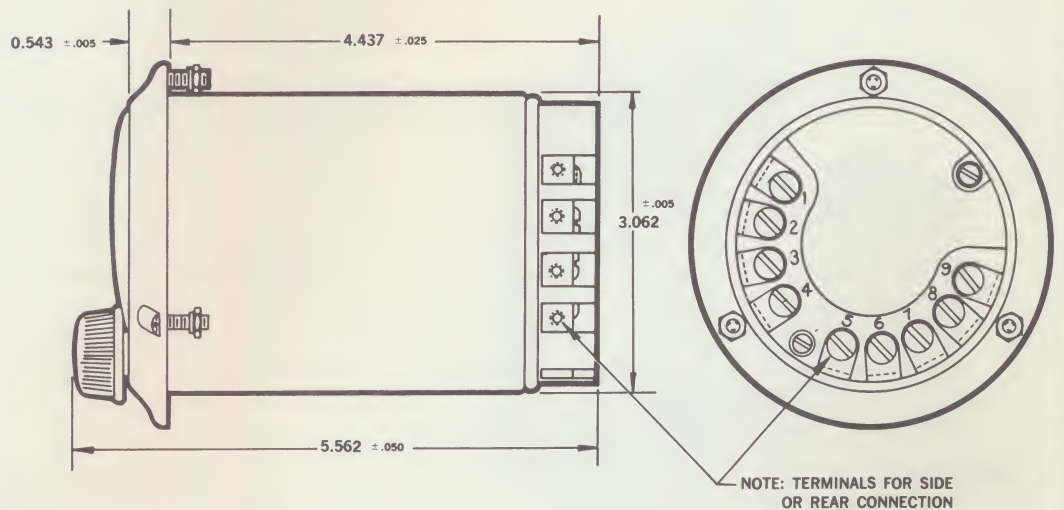
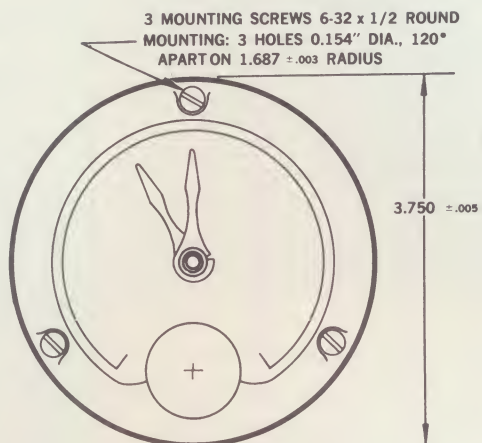
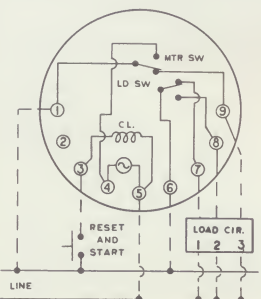
W.D.1125

Same as W.D.1122 except no re-set on power failure.



W.D.1126

Same as W.D.1123, Arrangements "B" & "C," except no re-set on power failure.



ORDERING INFORMATION

Timer: 412 or 422

Time Range

Voltage and Frequency

Wiring Diagram

Off-the-shelf—Cramer 412 Time Delay Relay in the majority of time ranges for 115 volt, 60 cycle operation is factory stocked (east and west coast warehouses) for immediate shipment on small quantity orders. Also stocked are many popular ranges for 220 volt, 60 cycle operation.

CRAMER 440A

One to Five Load Time Delay Relay

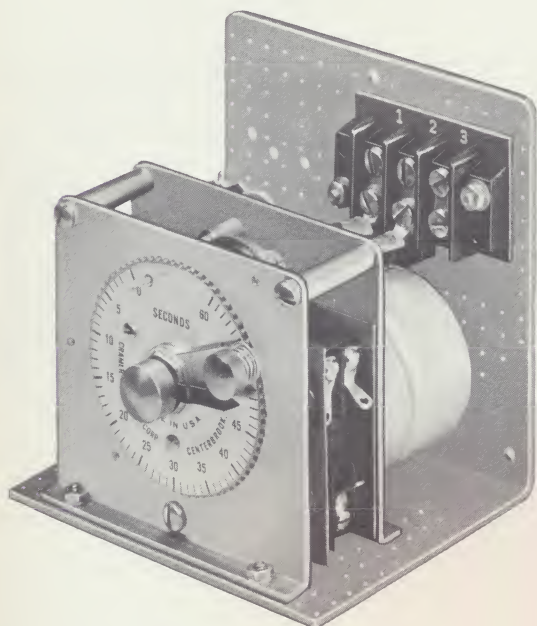
Time Ranges from 15 Sec. to 3 Hrs.

Rugged, Simple Construction

0.5% Repeat Accuracy

Optional Reverse Clutch

Provides an adjustable time delay between the operation of a control circuit and the subsequent opening or closing of one to five independent load circuits.

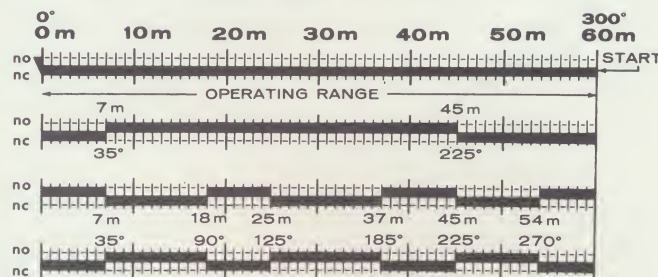


Cramer 440A may be used either to provide a fixed delay occurring after an adjustable starting point, or as an automatic re-set program timer, depending on the specification of switch actuating cams. Total operating ranges are available from 15 seconds to 3 hours, or longer on special order. The rugged, simple construction of the 440A makes it particularly suitable wherever shock and vibration are present.

OPERATION

Within the time range of any particular unit, the starting point can be varied in 5° increments by means of an adjustment knob on a calibrated dial. When the control circuit is broken, in the standard clutch unit, the timer re-sets automatically. A reverse clutch can be supplied which permits control of the timer by means of a momentary contact.

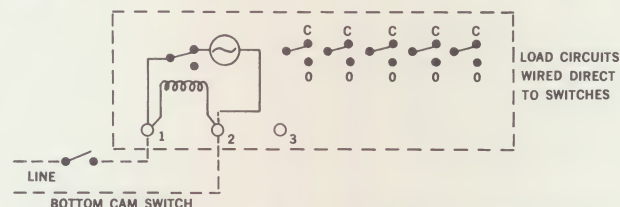
TYPICAL TIME DIAGRAM



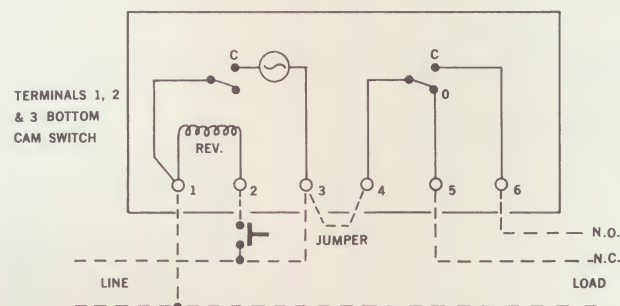
This time diagram shows the preferred graphic method of specifying time-delay programs to be controlled by the 440A. For further information, contact the factory or your local sales agent.

WIRING

The standard clutch is wired in parallel with the motor, and is actuated when the motor circuit is closed. In the reverse clutch units, the clutch is disengaged when the pushbutton is pressed, and drops into engagement again when the pushbutton is released.



STANDARD CLUTCH UNIT WITH FIVE LOAD CIRCUITS
WD-959



SIX TERMINAL REVERSE CLUTCH UNIT
WD-889

SPECIFICATIONS

Time Ranges:

Time Range	Dial Division	Time Range	Dial Division
15 sec.	0.25 sec.	15 min.	15.0 sec.
30 sec.	0.5 sec.	30 min.	30.0 sec.
60 sec.	1.0 sec.	60 min.	60.0 sec.
120 sec.	2.0 sec.	2 hrs.	2.0 min.
5 min.	5.0 sec.	3 hrs.	3.0 min.

Minimum Setting: 2 dial divisions.

Accuracy: ±1% of full scale at operating point of any one circuit, ±2% between operating points of any two circuits.

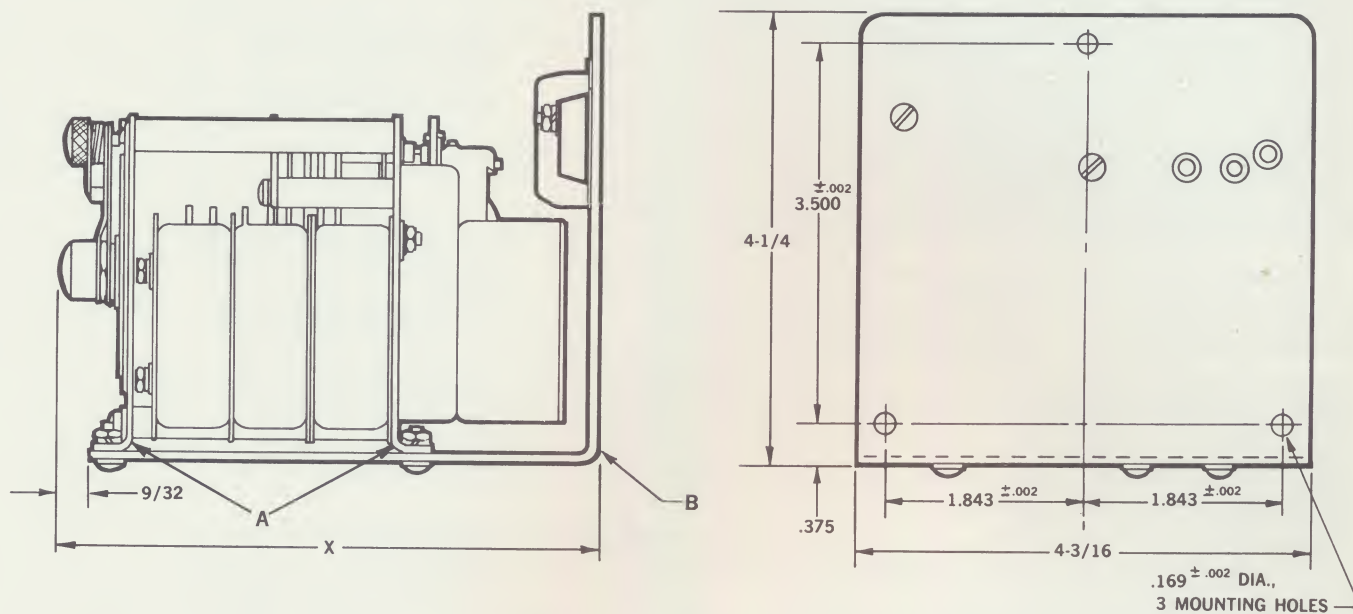
Repeat Accuracy: 0.5% of full scale.

Motor: Cramer synchronous, rated at 115 volts, 240 volts, 440 volts, 25, 50 or 60 cycles. DC and 400 cycle motors also available.

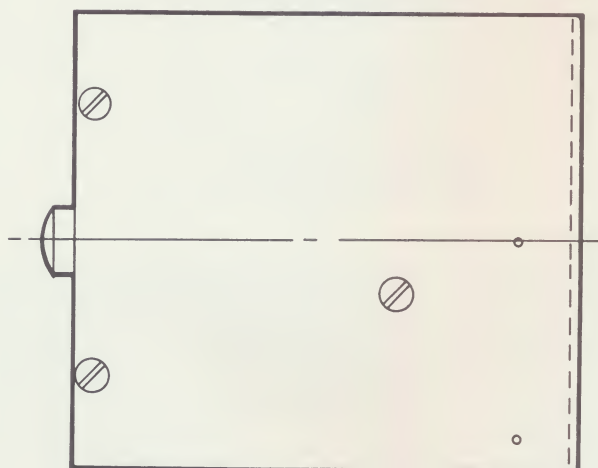
Clutch: Standard clutch, actuated simultaneously with the motor at the motor voltage and frequency, normally supplied. Separate motor and clutch circuits, reverse clutch, available on special request.

Switches: 1 to 5 snap acting SPDT. AC non-inductive rating is 10 amps at 125 volts, 5 amps at 250 volts. 20 amp switches available. DC (28 volt) non-inductive rating, 2 amps.

DIMENSIONS



For applications where space is limited, 440A can be supplied without the mounting bracket "B." Mounting is then made by means of screw holes in "A."



	1 & 2 Poles	3, 4 & 5 Poles
AC & Standard DC	3-25/32	4-63/64
400 Cycle; Standard DC with filter; Governed DC	4-3/64	5-7/16
Governed DC with filter; High vibration governed DC	4-27/64	5-13/16
High vibration governed DC with filter	4-11/16	6-3/32

"X" DIMENSIONS

ORDERING INFORMATION

Timer 440A
 Time Range
 Voltage and Frequency (Motor and Clutch)
 Number of Poles (Load Switches)
 Switch Rating
 Delay Required for Each Load Circuit
 Reverse Clutch, if desired

CRAMER 450

Flexible Time Delay Relay

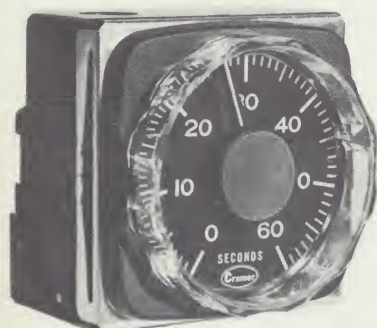
Up to Five Instantaneous and Timed Load Switches

3,000,000 Operation Life

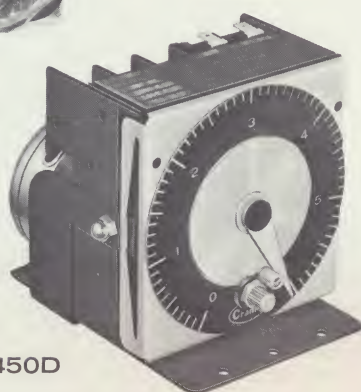
Rapid, Easy Setting of Time Intervals

Time Ranges from 12 Sec. to 30 Hrs.

Most flexible time delay relay available—SPDT load switch, motor control switch, provision for additional timed load switch, up to two instantaneous switches.



450A



450D

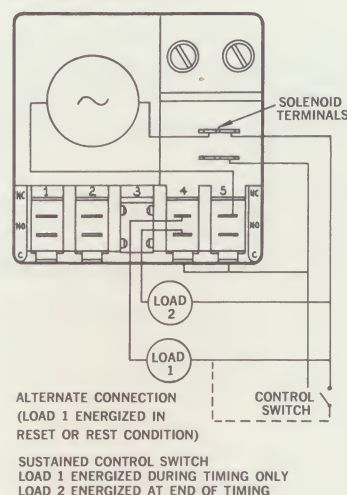
Cramer 450 is the most flexible time delay relay available. Its simple design provides a 3,000,000 operation mechanical life; its modern design makes setting of the desired time interval rapid and easy. The 450, in time ranges from 12 seconds through 30 hours, is available in a variety of mounting styles.

OPERATION

Cramer 450 Time Delay Relay in its basic form incorporates a single-pole, double-throw, timed load switch (#4) and a motor control switch (#5). There is provision for including an additional timed load switch (#3) and one or two instantaneous clutch switches (#1 & #2), which operate in conjunction with the clutching solenoid. The solenoid, internally wired to two external spade terminals (standard) or optional screw connectors, actuates the timing mechanism by engaging a gear set with the motor pinion. The one-way friction motor permits decreasing of the time setting or manual time-out while timing is in progress. Any setting can be increased for the following cycle while timing is in progress.

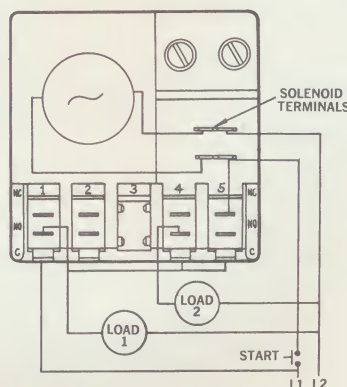
The panel mounted version (450A) is furnished with a clear plastic lens and setting knob, mounts to the panel with a threaded bushing and two anti-rotation pins (see dimensional drawings). The 450D chassis mount incorporates a simplified setting mechanism and is supplied as standard with the horizontal chassis mount shown in the photo. An optional vertical chassis mounting version of the 450D can be supplied on special order (see dimensional drawings).

CONTROL ARRANGEMENT NO. 1



NOTE:
Switches 1 & 2 are magnetically operated. They transfer when solenoid is energized and transfer back when control switch is opened.
Switches 4 & 5 are time operated. Switch 5 is a motor safety (cut-off) switch and operates 3 to 5 degrees after load switch 4, which operates at end of time cycle.

CONTROL ARRANGEMENT NO. 2



SPECIFICATIONS

Time Ranges:

Time Range	Dial Divisions	Time Range	Dial Divisions
12 sec.	0.2 sec.	30 min.	30.0 sec.
30 sec.	0.5 sec.	60 min.	1 min.
60 sec.	1.0 sec.	120 min.	2 min.
120 sec.	2.0 sec.	6 hrs.	6 min.
6 min.	6.0 sec.	12 hrs.	12 min.
12 min.	12.0 sec.	30 hrs.	30 min.

Minimum Setting: Two dial divisions.

Repeat Accuracy: 0.2% of full range or 1/10 second, whichever is greater (for 50 and 60 cycles—refer to factory for DC).

Re-set Time: 1/2 second, maximum.

Setting: Center knob 1:1 over 300-degree scale (60 divisions), setting indicator and progress pointer.

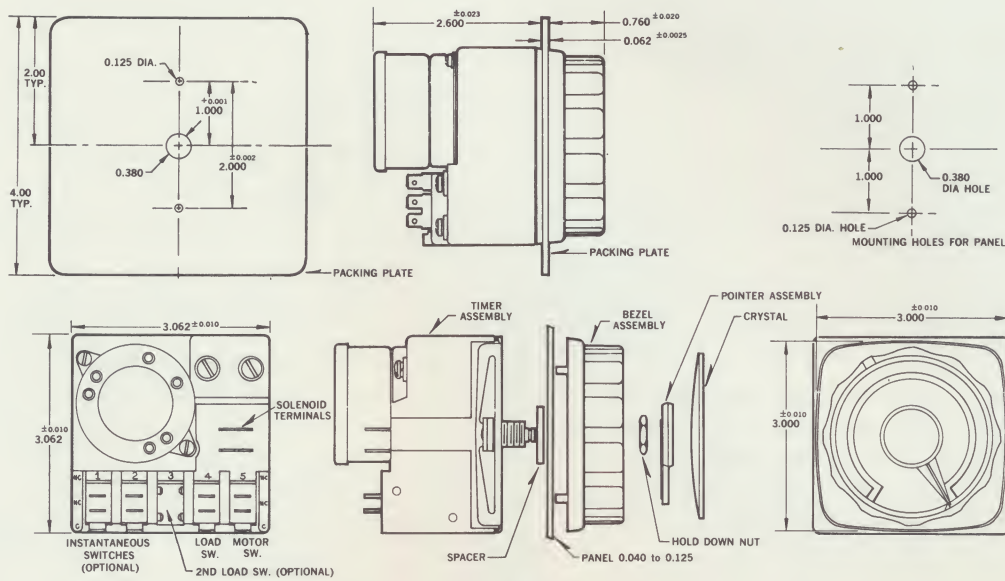
Control: 24 to 240 volts AC, 25, 50 and 60 cycles; motor—4.75 VA; clutch solenoid—6.0 VA.

Load Switch Rating: 10 amp res. @ 125/250 volts AC standard, 15 amp available.

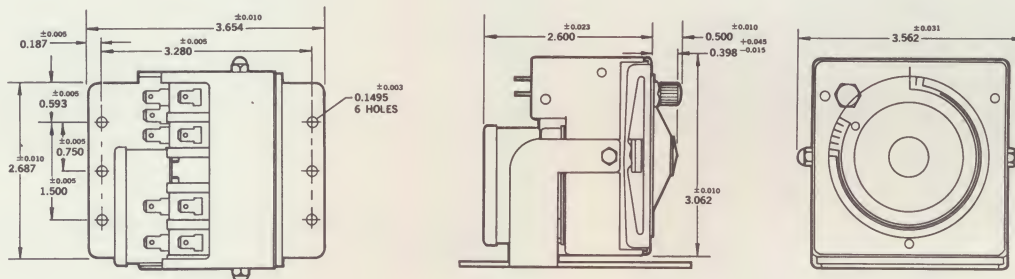
Terminals: Spade, standard; screw available.

Life: Expected mechanical life—3 million operations; expected electrical life—@ 10 amps resis., 115 volts AC, 150,000 operations.

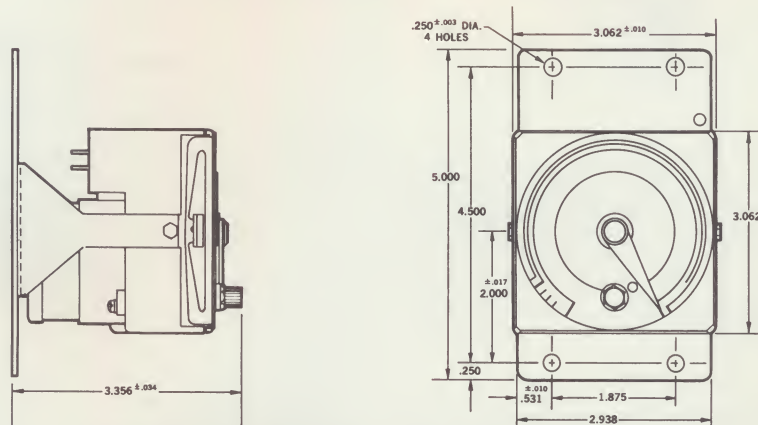
DIMENSIONS



450



450D



450D WITH VERTICAL MOUNTING BRACKET

ORDERING INFORMATION

Timer: 450A or 450D

Time Range

Voltage and Frequency (Motor and Clutch)

Number of Switches (Timed and Instantaneous)

Optional features: Screw Terminals, Vertical Mounting Bracket, Reverse Clutch

CRAMER 471

Low Cost, Adjustable, Time Delay Relay

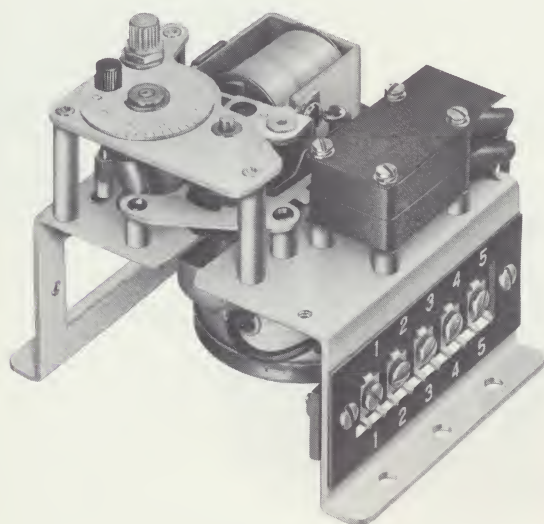
Broad Application Flexibility at Moderate Cost

Time Ranges From 15 Sec. to 24 Hrs.

2% Repeat Accuracy

1/2 Second Re-set Time

Primarily designed for built-in application, the 471 provides an accurate, adjustable time delay between the operation of a control circuit and the subsequent closing or opening of from one to three load circuits.



Cramer 471 Time Delay Relay is a moderate cost, chassis mount unit, adjustable through any of 11 standard time ranges. Its second and third load switches may be factory set to operate at end of timing, with Switch #1, or at any point during the timing cycle. Through selection of external wiring connections, the unit offers broad application flexibility and excellent accuracy. The 471 is powered by a Cramer high-torque synchronous motor.

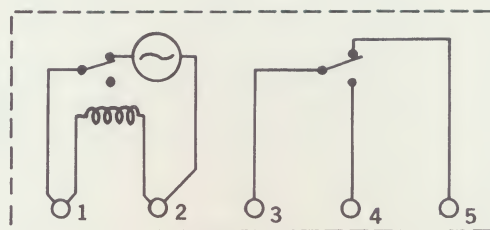
APPLICATIONS

Typical uses of the Cramer 471 include the control of machine tools, batch processes, heat treating, automatic mixers, electronic devices and signalling equipment of many kinds.

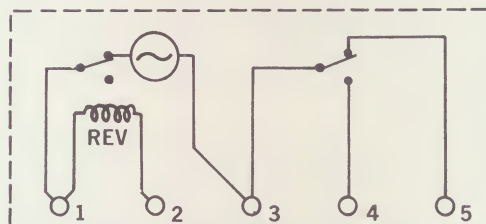
OPERATION

The Cramer high-torque synchronous motor drives precision-cut timing cams through a direct-acting or a reverse-acting clutch. In the direct-clutch model, applying power to the motor circuit automatically engages the clutch and timing starts at once. In the reverse-clutch model, motor and clutch are on separate circuits, and applying power to both circuits will start the motor but will hold the clutch disengaged until the clutch circuit is opened, at which time the clutch will engage and timing will start. An optional seal-in switch is available for momentary starting pulse applications.

WIRING



W.D. 1234



W.D. 1235

NOTE: Diagrams show contact when the timer is in re-set position.

SPECIFICATIONS

Time Ranges:

Time Range	Dial Division	Minimum Setting
15 sec.	1/2 sec.	1.5 sec.
30 sec.	1 sec.	3 sec.
60 sec.	2 sec.	6 sec.
5 min.	10 sec.	30 sec.
15 min.	30 sec.	1.5 min.
30 min.	1 min.	3 min.
60 min.	2 min.	6 min.
2 hrs.	5 min.	12 min.
5 hrs.	15 min.	36 min.
12 hrs.	30 min.	1 1/4 hrs.
24 hrs.	1 hr.	2 1/2 hrs.

Adjustment Ranges: From approximately 10% to 100% of full scale, for each time range, per marked, calibrated dial.

Repeat Accuracy: Within 2% of overall time range.

Re-set Time: Within 1/2 second.

Switch Ratings: SPDT quick-make, quick-break switches, rated at 10 amps 125 volts or 5 amps 250 volts AC, resistive load.

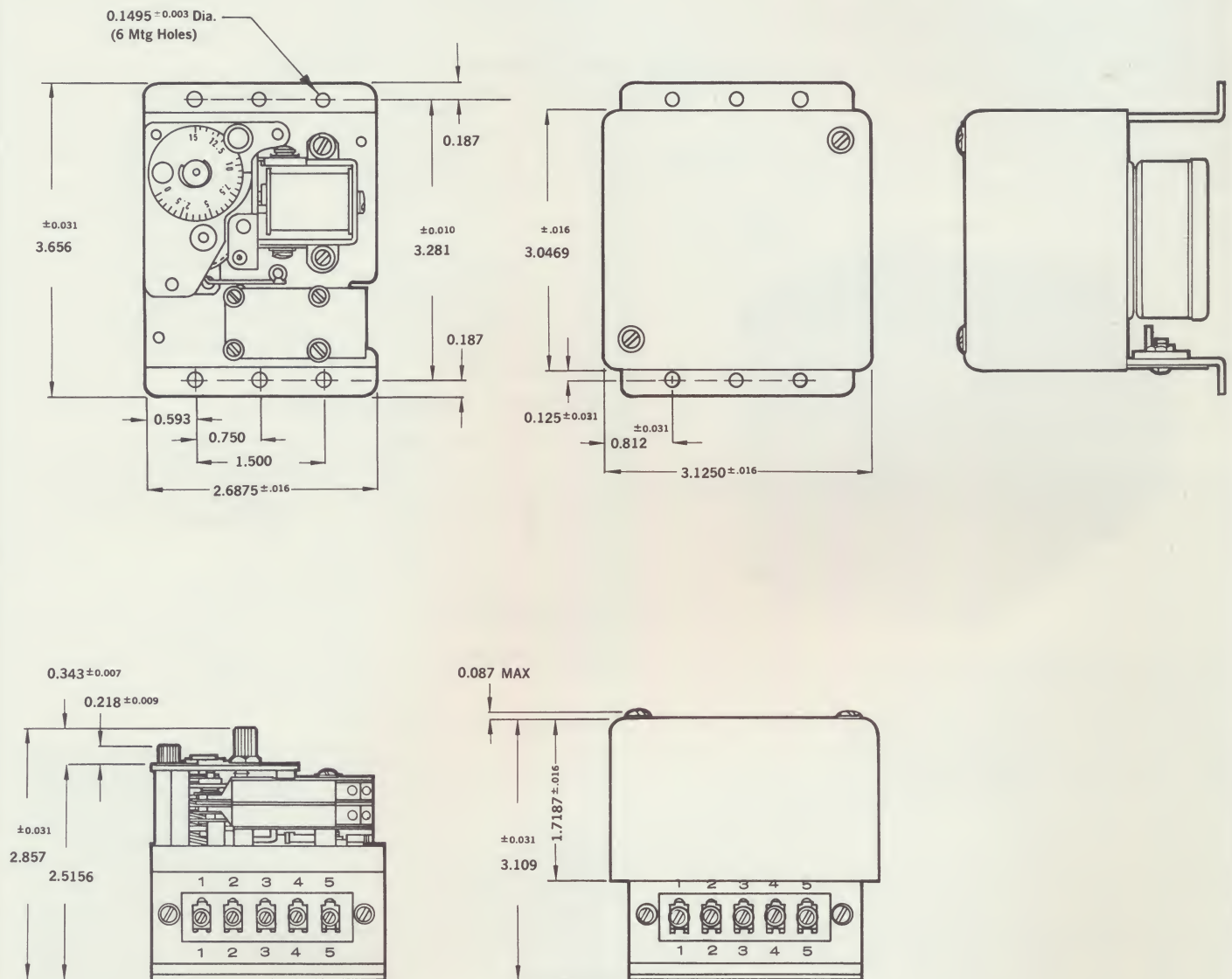
Motor and Clutch Ratings: 115 volts and 240 volts, 25, 50 and 60 cycles.

Direct or Reverse Clutch: Direct clutch is standard, reverse clutch available on special order.

Gears: Case-hardened steel, for extended life.

Life: Mechanical life in excess of 1,000,000 operations expected.

DIMENSIONS



ORDERING INFORMATION

Timer 471A—No Housing, 471P—with Cover
 Time Range
 Voltage and Frequency (Motor & Clutch)
 Number of Load Switches: One, Two or Three
 Standard or Reverse Clutch

CRAMER 280/480

Electronic Timers

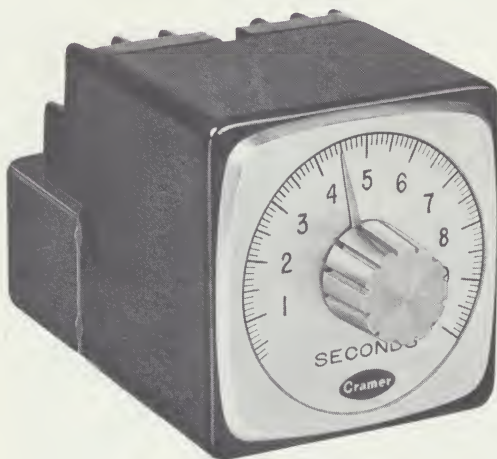
**Solid State—Long Life, No Warm Up Time,
Rugged**

Interval & Time Delay Applications

1, 10, 100 Second Time Ranges

±1.5% Accuracy

High reliability and long life combined in a low cost industrial unit ideal for any application requiring long life in terms of number of operations.



The Cramer 280/480 Electronic Timers are industrial units incorporating advanced circuit design and permitting operation directly from the AC power line. The units are available in 1, 10 and 100 second timing ranges with dial divisions of .01, 0.1 and 1.0 seconds respectively. They maintain excellent accuracy over a wide input voltage range, are fully transistorized to provide extremely long life and immediate warm-up.

INTERVAL TIMER

Cramer 280 Interval Timer is operated by sustained closure of a control circuit connected to the "start" terminals "S" and "S," or by momentary (pushbutton) closure of the control circuit if jumpers are installed between one "S" terminal and "7," and the other "S" terminal and "10" as shown in the control arrangement.

Closing the control circuit causes the load contacts to transfer and initiates timing. At the end of the timed interval selected on the dial, the load contacts return to their original position. If the control circuit is still closed, as with a sustained contact switch, the timing circuit does not re set for a second operation until the control switch is opened. Re set time is 30 milliseconds. If the control circuit is open at the end of the timed interval, as with a pushbutton switch, the timing circuit automatically re sets on reaching the end of the timed interval.

TIME DELAY RELAY

Cramer 480 Time Delay Relay is also operated by either sustained or momentary closure of the control circuit. Momentary-contact control requires factory installation of an auxiliary relay in the timer, available on special order at extra cost.

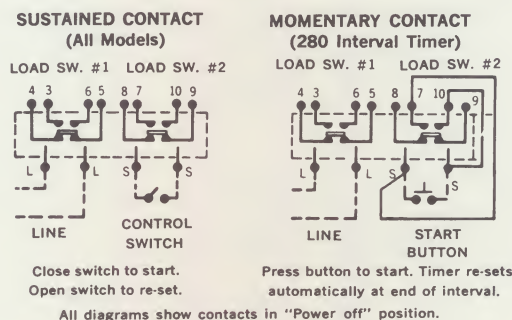
Closing the control switch initiates timing, but the load contacts do not transfer until the end of the timed interval selected on the dial. With sustained contact control, they remain transferred until the control switch is opened, at which point they

return to their original position and the timing circuit re sets for a second operation. Re set time is 30 milliseconds. With momentary-contact control, the load contacts return to their original position instantly, after transferring at the end of the time delay period. The result is a very brief pulse at the N.O. contacts of the load relay, occurring at the end of the set time.

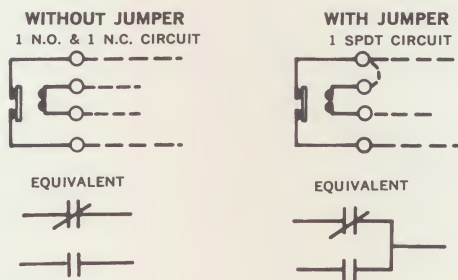
APPLICATIONS

Dielectric and induction heating equipment, molding machines, environmental test chambers, insulation testers, X-ray equipment, welding equipment, etc.

CONTROL ARRANGEMENTS



CONTACT CONNECTIONS



SPECIFICATIONS

Time Ranges: 1 second in .01 second dial divisions, 10 seconds in 0.10 second dial division, 100 seconds in 1 second dial divisions.

Repeat Accuracy: ±1.5% of full scale at rated voltage.

Setting Accuracy: ±2.5% of full scale.

Re-set Time: 30 milliseconds.

Warm-up Time: None.

Re-cycling Effect: Negligible.

Load Contacts: Two sets, each double-make, double-break.

Ratings: 25 amp resistive, 120 or 240 VAC; 25 amp inductive, 120 VAC (75% p.f.); 12.5 amp inductive, 240 VAC (75% p.f.); 1 H.P. 120 VAC (96 amp locked rotor); 2 H.P. 240 VAC (72 amp locked rotor); 25 amp resistive, 24 VDC.

Load Relay: Load relay is plug-in type, for quick field replacement. Simply snap the safety clamp and replace the relay. Gold-surfaced silver contacts available on special order.

Power Supply: 115 or 220 volts, 50 or 60 cycles. Other AC or DC, voltages and frequencies available on special order.

Power Consumption: 3 V.A. (relay energized).

Terminals: Spade terminal standard, screw type available.

Position: Timer will operate in any position.

Net Weight: 2¼ pounds.

Life: Timing circuit—in excess of 40 million cycles. Load relay—in excess of 10 million cycles (mechanical).

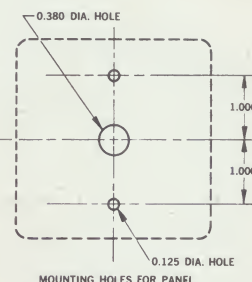
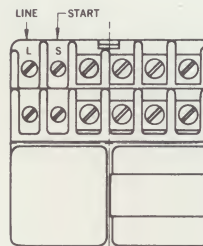
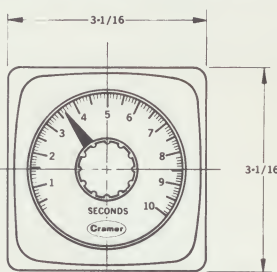
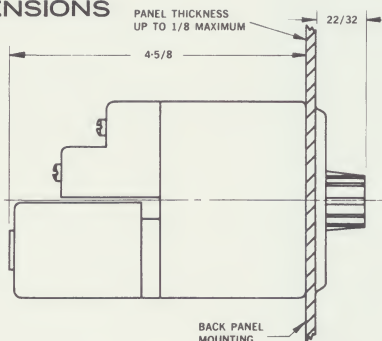
Max. Safe Operating Range: -10°C to +55°C (15°F to 130°F).

Operating Temperature Range: For ±1.5% Repeat Accuracy: +20°F to +100°F.

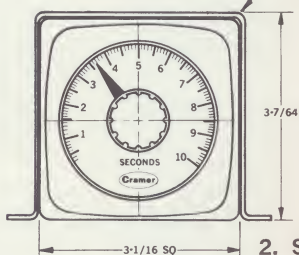
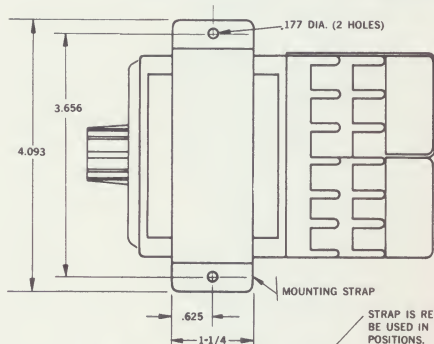
Shock and Vibration: Will withstand normal commercial levels. No electronic tubes used.

DIMENSIONS

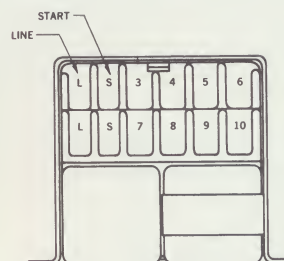
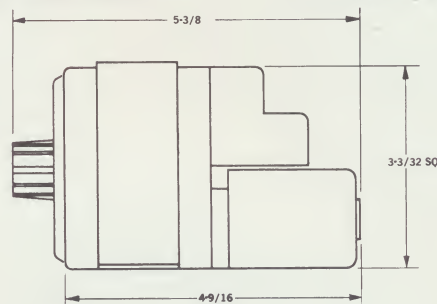
THREE MOUNTING OR CONTROL VARIATIONS ARE AVAILABLE.



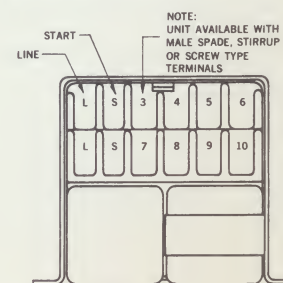
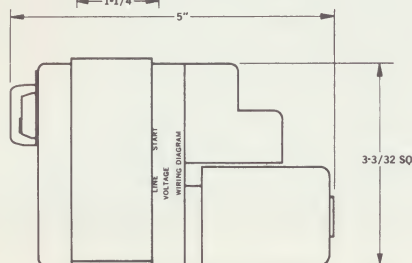
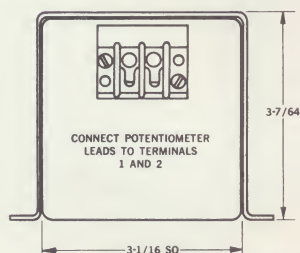
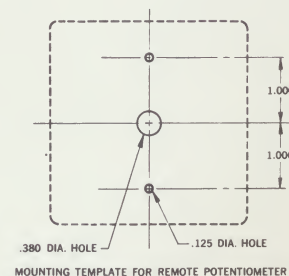
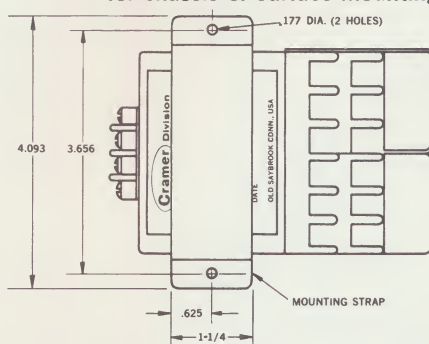
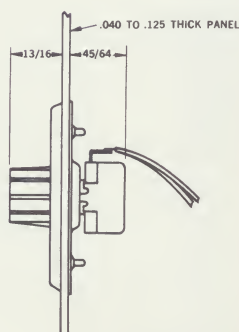
1. STANDARD UNIT FOR PANEL MOUNTING.



STRAP IS REMOVABLE AND MAY BE USED IN ANY ONE OF FOUR POSITIONS.



2. STANDARD UNIT WITH MOUNTING STRAP for chassis or surface mounting.



3. REMOTE CONTROL UNIT WITH SEPARATE POTENTIOMETER, KNOB AND CONTROL.

Mounting strap furnished for convenient mounting of timing module in any location remote from the control panel.

NOTE: Potentiometer and timer may be separated by as much as fifty (50) feet. For distances exceeding two (2) feet we recommend the use of shielded wire to interconnect potentiometer and timing module.

ORDERING INFORMATION

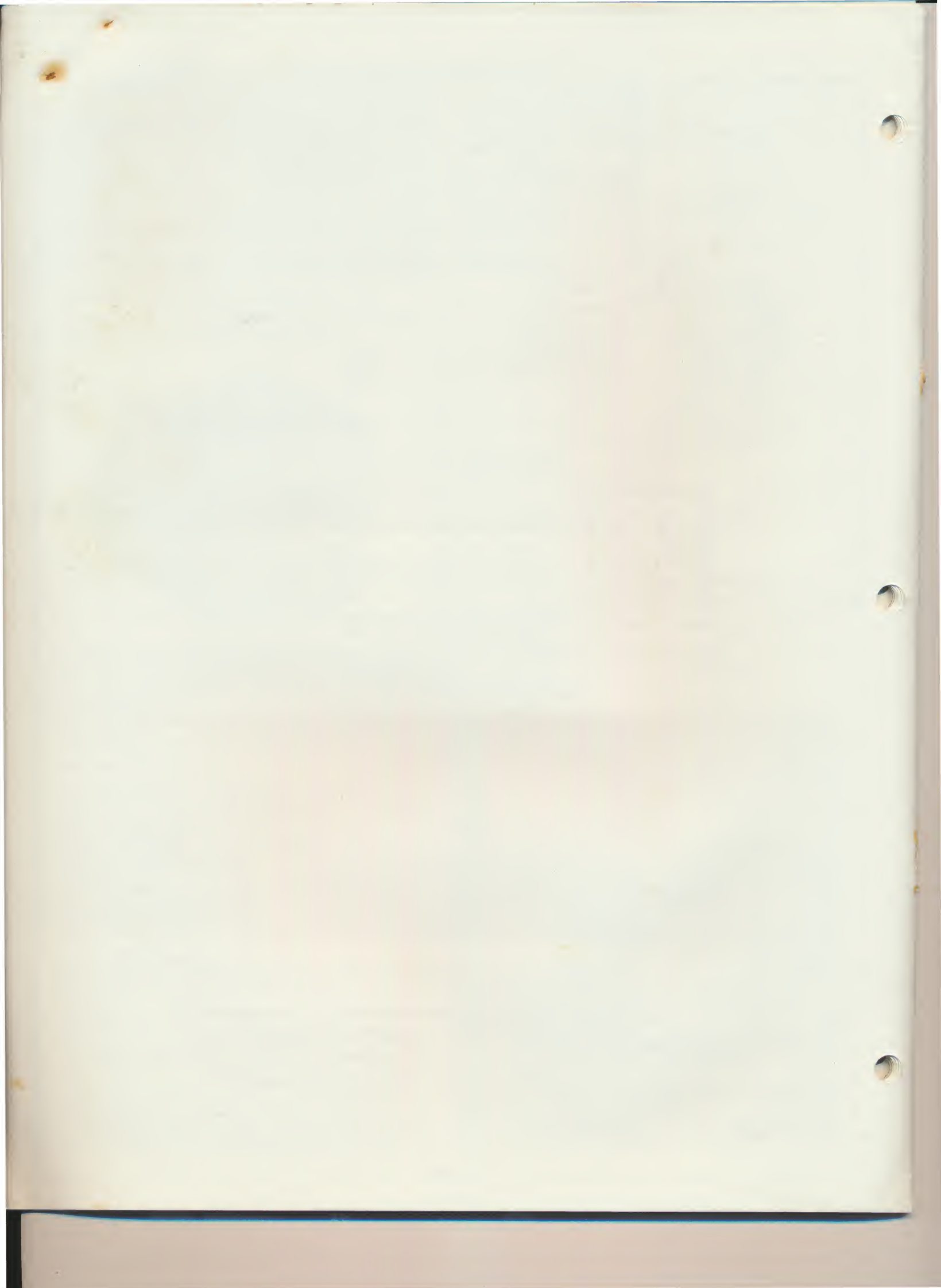
Timer: 280 (Interval Timer), 480 (Time Delay Relay)

Time Range (1, 10 or 100 seconds)

Operating Voltage and Frequency (115 volts or 220 volts, 50/60 cycles)

Control Method: Sustained contact or momentary contact

Replacement Load Relay (Interval Timer—Cramer Part A12-735-2; Time Delay Relay—Cramer Part A12-735-1)



CRAMER—Complete Timing Capability

ELECTROMECHANICAL COUNTERS AND ELAPSED TIME INDICATORS

Electrical impulse counters, six-digit readout, manual or remote electrical reset

Elapsed or running time indicators, five or six digit readout, dial readout

INSTRUMENT AND TIMING MOTORS

Feature power heads and gear trains that are detachable from each other for maximum application flexibility—hysteresis and permanent magnet synchronous, non-governed DC, special motor types

TIME DELAY RELAYS AND INTERVAL TIMERS

Time Delays to provide adjustable time lag in from one to four circuits

Interval Timers to control "on" or "off" time intervals for a number of applications

CYCLING TIMERS

Provide repetitive switching or cycling of from one to 100 load circuits

Make or break electrical circuits for a percentage of full cycle time

MILITARY TIMING DEVICES

Time delay relays, cycling timers, elapsed time indicators, time totalizers, electronic timers—which meet environmental specifications for military applications

GIANNINI CONTROLS CORPORATION

Astromechanics Research Division, Malvern, Pennsylvania / Conrac Division, Glendora, California / Control/Nucleonics Division, Duarte, California / Cramer Division, Old Saybrook, Connecticut / Datex, Monrovia, California / Instrument Division, Duarte, California / New Jersey Division, Fairfield, New Jersey / Powertron Division, Plainview, Long Island, New York / Giannini Controls Ltd., London, England.

Avionic and aerospace instruments and control systems / Professional, educational and industrial television monitors / Ultrasonic cleaning systems / Numerically controlled processing systems / Aerospace controls research / Timing devices and instrument motors / Aircraft control systems / Ultrasonic liquid level controls / Plastic and rubber thickness controls / Opacity control for paper-making industry.

CRAMER DIVISION, OLD SAYBROOK, CONNECTICUT

**GRAMER DIVISION
GIANNINI CONTROLS CORPORATION**

For more than 25 years, Cramer's mission has been to satisfy the timing needs of both industrial and military customers. Recurring problems lead to "standard" solutions, some of which are cataloged here. But how do you catalog capability, which is really what we offer? It's not limited to standards or specials, electronics or electro-mechanical, engineering or manufacturing, although all of these are included. We find it much more difficult to describe our total capability than to demonstrate it—may we have that opportunity with your company?

Thank you for your inquiry and your interest in Cramer products. The material you requested is enclosed.

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GIANNINI CONTROLS CORPORATION**

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THIS LINE AND DROP IN OUTGOING MAIL, NO POSTAGE NECESSARY.

Complete Timing Capability

CRAMER DIVISION, GIANNINI CONTROLS CORPORATION

Gentlemen:

- ☐ I have an immediate application for the following Cramer products:

- ☐ Please have Sales Engineer contact me _____
(date)

- ☐ I anticipate a future need for the following Cramer products:

- ☐ I have no immediate or future need for Cramer products, but have filed your literature for reference. Thanks.

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

TELEPHONE _____ EXT. _____

CITY _____ STATE _____